

# CENTER FOR ADVANCED ENERGY SYSTEM RUTGERS UNIVERSITY



The Center for Advanced Energy Systems  
is a multidisciplinary effort dedicated  
to the creation, development, and  
promotion of new technologies  
and practices in the field of  
energy systems.

## Field Management for Industrial Assessment Centers Appointed By



## USDOE

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>25 FEB 2004</b>		2. REPORT TYPE <b>N/A</b>		3. DATES COVERED <b>-</b>	
4. TITLE AND SUBTITLE <b>DOE Field Management for Industrial Assessment Centers</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Rutgers University</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release, distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>See also ADM001865, Industrial Process and Energy Optimization. Proceedings of the Industry Workshop Held in Gettysburg, PA, 25-27 February 2004., The original document contains color images.</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>UU</b>	18. NUMBER OF PAGES <b>35</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

# CENTER FOR ADVANCED ENERGY SYSTEM RUTGERS UNIVERSITY



- IACs are University Based Centers Headed by Engineering Faculty
- Located at 26 Universities Across the Country
- Staffed by Professional Engineers and Student Engineers



## *Industrial Assessment Center Purpose:*

- Help small to medium-sized manufacturers reduce energy and waste costs and increase productivity
- Train engineering students in energy efficient practices

# CENTER FOR ADVANCED ENERGY SYSTEM

## RUTGERS UNIVERSITY



### History

- Established in 1976 (formerly known as the EADC – Energy Analysis and Diagnostic Center)
- Federally funded by the U.S. Department of Energy through the Office of Energy Efficiency and Renewable Energy's Industrial Technologies Program



## What does the IAC do for you?

- Energy
  - Analyze your energy bills
  - Investigate and recommend energy saving opportunities in your facility
- Waste
  - Investigate and recommend waste minimization opportunities
- Productivity
  - Investigate and recommend opportunities that will decrease energy output per unit of production



## IAC Assessment Protocol

### Step 1:

Client contacts IAC for a one or a two day assessment of their plant. The IAC sets up a tentative date for the assessment and request that client send energy bills, equipment and general plant information.



## IAC Assessment Protocol

### Step 2:

The IAC analyzes all the information provided by the client and formulates a plan of action for the assessment. By taking a look at the plant details before hand helps the IAC team diagnose symptoms of inefficiency currently in the plant.





## IAC Assessment Protocol

### Step 3:

The IAC team goes on a one or a two-day assessment to the manufacturing facility

# CENTER FOR ADVANCED ENERGY SYSTEM RUTGERS UNIVERSITY



## Site Visit

- A Typical IAC Site Visit Consists of the Following:
  - Initial Interview with Plant Personnel in the Morning.
    - During this meeting the facility personnel provides the IAC team an explanation of plant information, including the facility's energy usage and costs.
    - Additional plant data is also gathered at this point.
  - Tour of Plant
    - Observe production operations.
    - Identify symptoms of inefficiency at the plant
    - Gather ideas for conserving energy, reducing waste, increasing productivity.

# CENTER FOR ADVANCED ENERGY SYSTEM

## RUTGERS UNIVERSITY



- Discussion:
  - Discuss and Brainstorm Ideas for Possible Improvement Opportunities.
  - Create and Assign Projects to Students for further research.
  
- Gathered Data to [that will] Support Analysis of Savings. Some of the tools used for measurement in this stage are:
  - Data Loggers
  - Ultrasonic Guns
  - Boiler Flue Gas Analyzer etc.
  - Infrared Gun
  - Power Monitoring Equipment
  
- Exit interview with plant personnel to discuss all opportunities identified and the feasibility of implementation at the plant if developed into recommendation



## IAC Assessment Protocol

### Step 4:

The IAC returns to University and starts to develop a full engineering report. The IAC team has 60 days to produce report and supply to the client.



## Report Generation

- Students complete analysis, write-up results
- Lead Student compiles opportunities into a report
- Faculty reviews report and returns to Lead Student
- Faculty completes review
- Report mailed to plant within 60 days

# CENTER FOR ADVANCED ENERGY SYSTEM RUTGERS UNIVERSITY



- Implementation Results are Tracked
  - Center personnel calls plant 6 - 9 months after report is sent
  - Inquires about plant's response to report
  - Results uploaded to national database
  - Results used in future assessments
- About 40% of Projects are Implemented



## IAC Assessment Protocol

Although, the report format used by the different IACs are unique, it has some uniformity.

For Example:

All reports are required by the field manager to contain some essential information, such as:

- Summary of Savings
- Executive summary
- Utility Analysis
- Recommendation Write-up etc.

# CENTER FOR ADVANCED ENERGY SYSTEMS

## RUTGERS UNIVERSITY



### IAC Assessment Protocol

The following table is a summary of the electric and natural gas energy savings, potential dollar savings, implementation cost, and the simple payback period. These figures are obtained from each individual Assessment Recommendation (AR) in Section 4 of this report.

SUMMARY OF ENERGY SAVINGS AND COSTS						
AR No.	Description	Potential Conservation (MMBtu/yr)	Potential Savings (\$/yr)	Resource Conserved	Impl. Cost (\$)	Simple Payback (yr)
1.	Use Dryers Instead of Compressed Air	42.0	34,146	Electricity	2,160	0.06
2.	Install Radiant Heaters	2,054.7	11,608	Natural Gas	9,050	0.78
3.	Use Most Efficient Type of Electric Motors	768.5	8,569	Electricity	15,260	1.78
4.	Install Choppers in the Dust Collector System	650.7	5,816	Electricity	6,800	1.17
5.	Install Occupancy Sensors	136.8	3,047	Electricity	2,175	0.71
6.	Use Energy-Efficient Balls and Other Improved Mechanisms	248.9	2,778	Electricity	444	0.16
7.	Preheat Intake Air of Gas Fired Oil Heater	232.4	973	Natural Gas	2,580	2.56
8.	Replace Existing Exit Sign Lamps	14.2	356	Electricity	1,080	3.03
9.	Replace Metal Halide Fixtures with Fluorescent Fixtures and Add Occupancy Sensors	28.5	346	Electricity	135	0.39
TOTALS		4,199.9	68,288	-----	39,556	0.58

Note that the calculated potential electric cost savings are based on the effective unit cost of electric energy and the effective demand cost when applicable. The effective energy cost is found to be approximately \$0.0305/kWh and the effective demand cost is about \$5.23/kWm. These figures are found in the Electrical Summary table on page 15.

The potential natural gas cost savings are calculated using the effective natural gas cost found in the Gas Summary table on page 16. This figure is found to be about \$6.618/MMBtu.

IA0335  
6

AR Description
1. Reduce Comp
2. Reduce Comp
3. Install High Eff
4. Install Electron
5. Install High Eff
6. Install Occupa
7. Insulate Melt P
8. Insulate Heat T
9. Insulate Ingot P
Totals

Implementation: Other sts (\$)	Primary Area <sup>a</sup> Affected
	E
	E
	E
	E
	E
29	E
275	E
32	E
	E
143	





## IAC Assessment Protocol

The field manager has developed manual over time to maintain some level of consistency in training. Some of the manuals are:

- Industrial Productivity Training Manual
- Modern Industrial Assessment Training Manual
- Industrial Assessment Database Manuals
- The Arc Manuals

# CENTER FOR ADVANCED ENERGY SYSTEM RUTGERS UNIVERSITY



## Purpose:

These manuals were used to train IAC directors at one time in energy, Waste and productivity.



## IAC Training

Working Toward Consistency

- Energy
- Waste
- Productivity

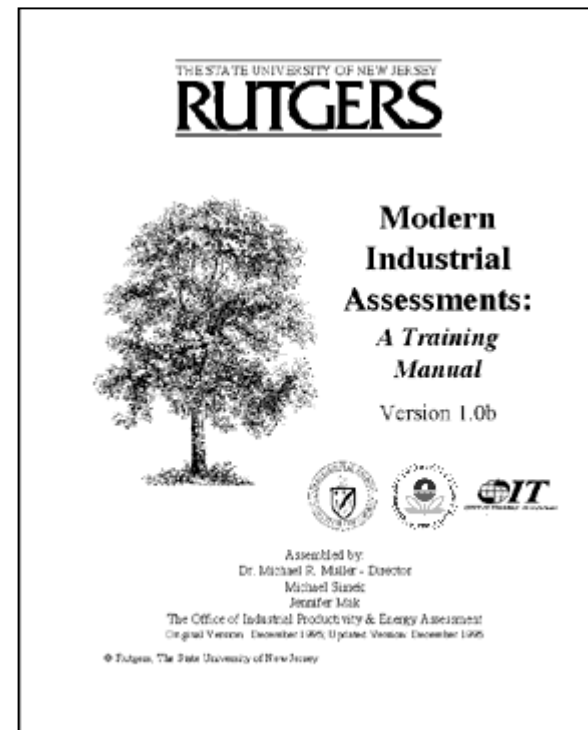
# CENTER FOR ADVANCED ENERGY SYSTEM

## RUTGERS UNIVERSITY



- **Energy Training**

- Every New Center is Trained
- Modern Training last held 1993
- Manual Developed by Colorado State U.
- Modern Industrial Assessments

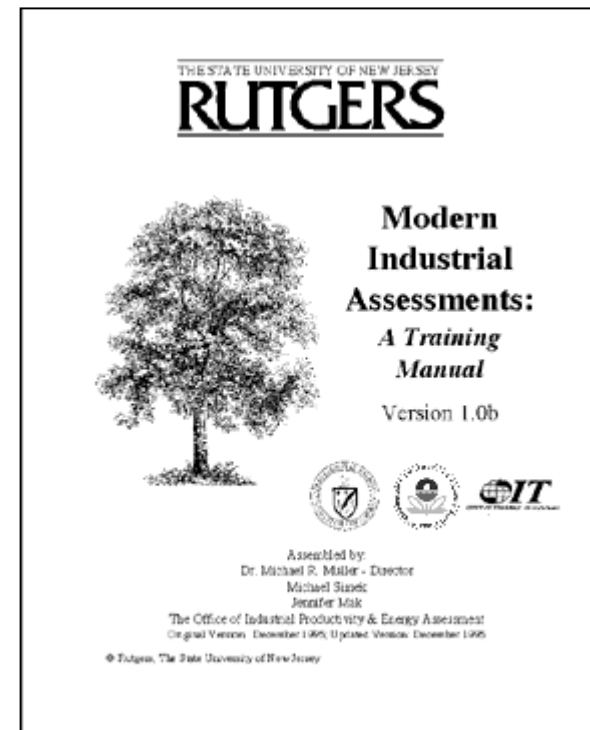


# CENTER FOR ADVANCED ENERGY SYSTEM RUTGERS UNIVERSITY



- **Waste Training**

- Every New Center is Trained
- Modern Training last held 1994
- Manual Developed by U. of Tennessee
- Modern Industrial Assessments



Caes.rutgers.edu



## Industrial Productivity Training

Background:

Initially part of Climatewise

CAES involved with adding an energy / waste component to the PICOS supplier program run by General Motors.

GM personnel observed IAC style assessment

CAES observed a PICOS assessment.



## Industrial Productivity Training

At this point it became clear that the IAC assessments could be more effective if efforts were put into direct productivity

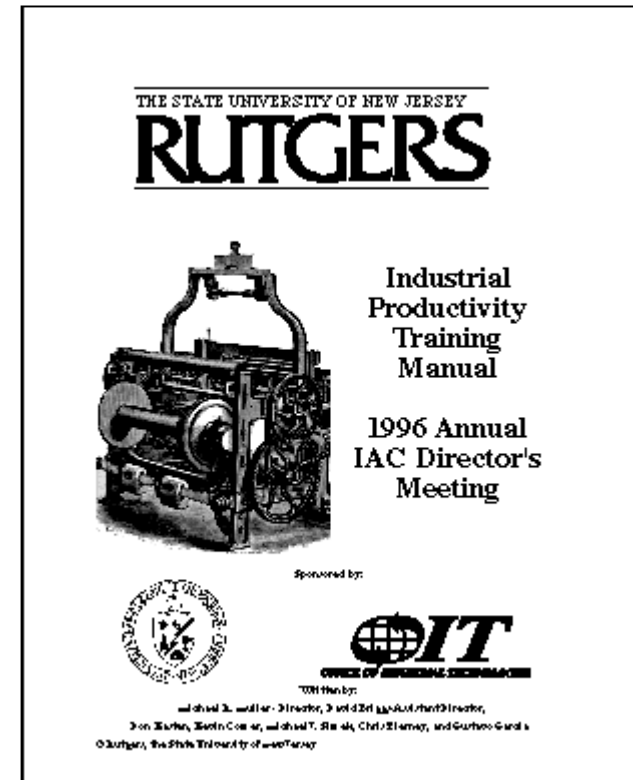
As a result, training and a manual was developed to train the IAC directors in productivity related topics.

# CENTER FOR ADVANCED ENERGY SYSTEM RUTGERS UNIVERSITY



- **Productivity Training**

- Every New Center is Trained
- Modern Training last held 1996
- Manual Developed by Rutgers University
- Industrial Productivity Training Manual



Caes.rutgers.edu





## Modern Industrial Assessment: A Training Manual

### Background

- effort made by the US DOE to provide technical training to a range of potential end users interested in performing industrial assessments at small to medium sized manufacturing plants
- effort of course instructor's to provide the best training methods and material to the new industrial assessors. This 400+ pages manual is used by the IAC to train their staff on energy related topics for the assessments

# CENTER FOR ADVANCED ENERGY SYSTEM

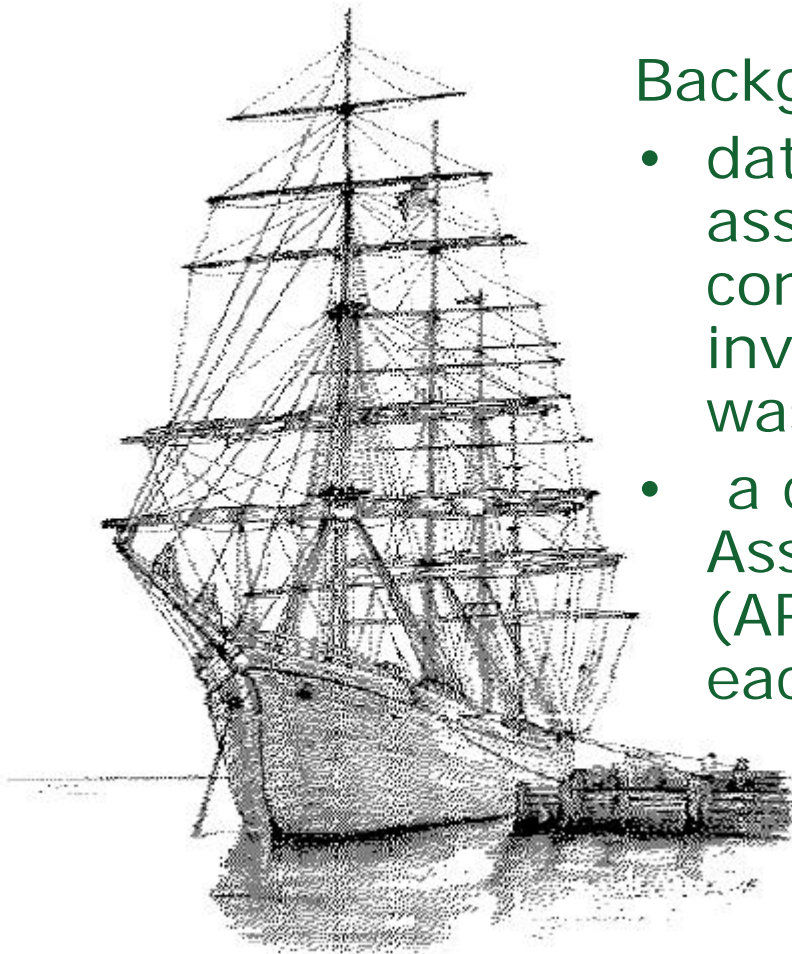
## RUTGERS UNIVERSITY



## The ARC Manual

### Background:

- database resulting from assessments carried out by the IACs contains a list of recommendations involving enhancements in energy / waste / productivity.
- a coding system called the Assessment Recommendation Code (ARC) has been developed to list each recommendation.
- IACs use this system to upload assessment information to the database





# **Self-Assessment Workbook**

## ***For Small Manufacturers***

**Version 2.0**

**October 2003**

**Dr. Michael R. Muller**

**Kyriaki Papadaratsakis**

**Funding for this Manual is provided by the**

**US Department of Energy**

**Office of Energy Efficiency and Renewable Energy**



## BestPractices Tools

- AIRMaster+
- Process Heating Assessment and Survey Tool (PHAST)
- Pumping System Assessment Tool (PSAT).
- Steam System Tool Suite
  - Steam System Scoping Tool
  - Steam System Assessment Tool (SSAT 1.0.0)
- 3E Plus Version 3.2
- Decision Tools for Industry
- ASDMaster: Adjustable Speed Drive Evaluation Methodology and Application



## The IAC Database

- *National Database of Assessments*
  - Maintained by the Center for Advanced Energy Systems at Rutgers University
  - Assessment results uploaded by Centers
    - Recommended projects, savings & costs
    - Implemented projects, savings & costs
  - Contains information on over
    - 11,000 assessments
    - 80,000 recommendations



## Special Projects

- Replication Project:

### Mission:

To expand the reach of the IAC program to companies with multiple energy intensive plants to save the company energy and money



## Replication Project

- Idea started with Alcoa Aluminum
- Received several IAC Assessments
- Created their own team of
  - Internal experts
  - Consultants
- Project has been extremely successful



## Replication Project

### Procedure:

- The IAC team performs an assessment at one of the client plants.
- Plant personnel gets trained on assessment procedures
- IAC team and the plant personnel collaborate on the report.
- Trained plant personnel go on and audit a second plant overseen by the IAC team





## Replication Clients

Client #1:

Cardboard Manufacturer

Progress:

1<sup>st</sup> Assessment Completed

2<sup>nd</sup> Assessment Scheduled

Possible Clients:

Fabric Manufacturer

Chemical Company

# CENTER FOR ADVANCED ENERGY SYSTEM RUTGERS UNIVERSITY



*Field Manager is Center for Advanced Energy  
Systems (CAES) at Rutgers, The State  
University of New Jersey*

*Director: Dr. Michael R. Muller  
Center for Advanced Energy Systems*

*Rutgers University*

*640 Bartholomew Road*

*Piscataway, NJ 08854*

*Phone: (732) 445 – 5540*

*Fax: (732) 445 - 0730*

*Email: [muller@caes.rutgers.edu](mailto:muller@caes.rutgers.edu)*

*<http://caes.rutgers.edu>*



## **The DOE Industrial Assessment Database Manual**

### **Background:**

Since 1981, the data resulting from the assessment performed under this program have been collected into a database which is available to general public. The database manual is intended to act as a tool for proper use and understanding of the IAC databases. Complete description of the data fields, coding schemes, and other data resources are included in the manual to allow the user to discover the wealth of information contained in the database.

# CENTER FOR ADVANCED ENERGY SYSTEM RUTGERS UNIVERSITY



The Center for Advanced Energy Systems  
is a multidisciplinary effort dedicated  
to the creation, development, and  
promotion of new technologies  
and practices in the field of  
energy systems.

## Field Management for Industrial Assessment Centers Appointed By USDOE

